UNITED STATES DEPARTMENT OF COMMERCE
National Telecommunications and Information Administration
Washington, D.C. 20230

SEP 24 2004

Mr. Edmond J. Thomas
Chief, Office of Engineering and Technology
Office of Engineering and Technology
Federal Communications Commission
445 12th Street S.W.
Washington, DC 20554

Re: Amendment of Part 15 Regarding New Requirements and Measurement Guidelines for Access Broadband over Power Line Systems (FCC 04-29), ET Docket No. 04-37 ("BPL NPRM")

Dear Mr. Thomas:

In our June 4, 2004, comments on the above referenced NPRM, the National Telecommunications and Information Administration (NTIA) stated that it was continuing to study the possible requirement for Access BPL transmission of identification codes as well as certain details of compliance measurement guidelines.[1] The enclosure presents NTIA's analysis of candidate identification code transmission methods and NTIA will present the voluminous data used to assess compliance measurement procedures in Phase 2 study. As a result of this further study, NTIA has updated its positions as follows.

- NTIA cannot support a requirement for Access BPL transmission of identification codes. NTIA comments, at 12. Among various problems with such a requirement, none of the implementations conceived and assessed by NTIA would fulfill the underlying goal of enabling effective diagnosis of suspected interference using a conventional radio receiver.

- NTIA prefers the Commission's proposal to measure Access BPL field strength at various specific locations along a power line rather than the more exhaustive search for peak levels that was contemplated by NTIA. BPL NPRM, at Appendix C; NTIA Comments, at 17-19. NTIA's extensive further analysis shows that the overall peak field strength that would be found in an exhaustive search along the power line would not significantly exceed the peak level measured using the streamlined approach proposed in the NPRM. The relative simplicity, reasonable accuracy and potentially better repeatability afforded by the Commission's approach are prevailing considerations.

- NTIA has confirmed that the tacit Part 15 assumption of 377 Ω wave impedance can be used reliably for Access BPL field strength measurements using a loop antenna below 30 MHz even though these measurements are performed in the near field where wave impedance at various locations can vary widely. NTIA Comments, at 22. Viewed in the context of the

[1] Comments of the National Telecommunications and Information and Information Administration (NTIA Comments) in ET Docket No. 04-37 (June 4, 2004), (available at www.ntia.doc.gov/ntiahome/fccfilings/2004/BPLComments_06042004.pdf).

overall measurement procedure, this assumption is valid at the important measurement locations (i.e., where electric field strength is near its peak level).

- NTIA fully supports the Commission's proposed distance extrapolation and measurement antenna height provisions, as applied in connection with the Commission's proposed use of slant path distance to the power line. BPL NPRM, at Appendix C; NTIA Comments, at 16-17 and 19-21. NTIA's computer modeling results show that variation of field strength with distance is consistent with the Commission's proposed distance extrapolation using slant-path distance rather than horizontal distance. NTIA's computer modeling results using this new distance coordinate system also show that there is no need to apply a height correction factor at frequencies below 30 MHz. At frequencies above 30 MHz, NTIA's computer modeling results show that increases of field strength with height are properly captured either by varying the measurement antenna height between one and four meters as proposed by the Commission or by using a one meter antenna height with a 5 dB height correction factor as proposed by NTIA.

I respectfully request that you consider NTIA's updated positions and rationale in your development of revised rules for Access BPL systems.

Sincerely,

Fredrick R. Wentland
Associate Administrator
Office of Spectrum Management

Enclosure

NTIA ASSESSMENT OF CANDIDATE MEANS FOR ACCESS BPL TRANSMISSION OF IDENTIFICATION CODES

1. INTRODUCTION

NTIA suggested in its comments on the BPL NPRM that a requirement for transmission of Access BPL identification codes should be considered only if such transmissions would not increase risks of interference.[2, 3] In the meantime, NTIA developed additional criteria for evaluating this potential requirement, including: effectiveness of such transmissions in diagnosis of suspected interference using a conventional communications receiver; potential reduction of BPL throughput; and cost impact. None of the candidate identification code frequency plans and modulation schemes considered by NTIA would yield acceptable increases in interference risk, acceptable reductions in BPL throughput; or effectively facilitate diagnosis of suspected interference. Hence, NTIA did not consider potential cost impact. In any case, once receiver system malfunctions are dismissed as the cause of suspected interference, interference can be diagnosed unilaterally, via radio direction finding and localization or examination of the spectrum signature, or in cooperation with the BPL operator via scheduled BPL frequency shifts, scheduled brief powering off of the suspected BPL device, or other means.

NTIA also notes that requiring an unintentional emitter such as Access BPL to intentionally radiate a radio signal of any kind might present a regulatory conundrum. The Commission is well equipped to examine that factor in the event that any party believes that there exists a suitable technical means for Access BPL radio transmission of identification codes.

2. CANDIDATE ACCESS BPL IMPLEMENETATIONS OF POTENTIAL REQUIREMENTS FOR TRANSMISSION OF IDENTIFICATION CODES

As NTIA understands the concept, the use of transmitted identification codes to facilitate diagnosis of suspected interference would be effective only if a conventional radio receiver could be used to receive the codes intelligibly. Radio communications receivers generally operate with amplitude (AM) or single sideband (SSB) modulation at frequencies below 30 MHz and frequency modulation (FM) at frequencies between 30 MHz and 80 MHz. To be effective, the identification code transmitted by the BPL system would have to produce an intelligible signal, e.g., Morse code symbols, at audio output of these receivers.

Three fundamental families of signaling schemes were examined:

- Out-of-band signaling using a separate modulated radio-frequency carrier;
- In-band signaling using an embedded, separate modulated radio frequency carrier;
- Signaling via modulation of the fundamental BPL signal.

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[2] Comments of the National Telecommunications and Information and Information Administration (NTIA Comments) in ET Docket No. 04-37 (June 4, 2004), at viii/ix and 12 (available at www.ntia.doc.gov/ntiahome/fccfilings/2004/BPLComments_06042004.pdf).

[3] Amendment of Part 15 Regarding New Requirements and Measurement Guidelines for Access Broadband over Power Line Systems (FCC 04-29), ("BPL NPRM"), ET Docket No. 04-37.

3. OUT-OF-BAND SIGNALING USING A SEPARATE MODULATED RADIO-FREQUENCY CARRIER

The spatial distribution of field strength generated by Access BPL systems varies substantially at different frequencies. NTIA has observed this frequency-selective behavior in its measurements as well as the thousands of Access BPL models that have been assessed using Numerical Electromagnetic Code (NEC) software. Thus, Access BPL transmission of an identification code using frequencies outside the frequencies used for BPL telecommunications will not correlate with the interference potential of the fundamental BPL signal. This approach would invite unfounded complaints because a harmfully strong identification signal could be received even when the fundamental BPL signal is causing no perceptible degradation let alone harmful interference. Moreover, although the separate identification signal could be confined to one 3 kHz radio frequency channel (typical at frequencies below 30 MHz), these channels are too valuable to radio operators to risk this unnecessary increase in potential interference.

4. IN-BAND SIGNALING USING AN EMBEDDED, SEPARATE MODULATED RADIO FREQUENCY CARRIER

Embedding a separate modulated radio frequency carrier within the bandwidth used by the fundamental BPL signal at the same power density level as the surrounding BPL signal would yield a good degree of correlation between the identification signal and adjacent portions of the fundamental BPL signal. This could be accomplished in connection with the proposed notching of the BPL signal that has been proposed for prevention or elimination of interference. Conceptually, at some cost, this embedded carrier could be modulated in a manner that would produce intelligible audio responses in AM or SSB receivers at frequencies below 30 MHz and in FM receivers above 30 MHz, perhaps by switching between these modulation schemes sequentially or according to the operating frequency. However, even highly skilled radio operators could have difficulty finding this particular identification signal among all the active radio channels, some of which may be occupied by coded radio transmissions similar to the contemplated BPL identification codes. Pre-designating specific Access BPL frequencies for transmission of identification codes in a database or the rules is contrary to the flexible notching (or frequency agility) capabilities that are desired for prevention or elimination of interference. Designation of identification frequencies relative to the overall frequency placement of the fundamental BPL signal would not be helpful because the BPL signal placement cannot be reliably determined using the radio receiver.

5. SIGNALING VIA MODULATION OF THE FUNDAMENTAL BPL SIGNAL

In theory, the entire fundamental BPL signal could be modulated to effect transmission of an identification code. Frequency or phase modulation could result in mutual interference with respect to the fundamental BPL signal, which typically is phase or frequency modulated; however amplitude modulation was considered to be a promising approach. NTIA discussed this possibility with several BPL developers and suggested that occasional, low-speed amplitude modulation of the normal BPL signal with a Morse-coded identification might meet these criteria. This AM approach could be compatible with AM and SSB receivers and could

conceivably yield an audible signal at the output of an FM radio that is tuned to a radio transmission (e.g., via consequential amplitude variation of the audible radio transmission caused by receiver automatic gain control response).

One BPL developer subsequently experimented with NTIA's contemplated amplitude modulation approach and reported that drastic variation of the BPL signal amplitude (e.g., over 20 dB) is needed to produce an intelligible code signal at the audio output of a conventional receiver. Such reductions of BPL signal amplitude from the normal operational levels unacceptably interrupts BPL throughput. Conversely, increasing the BPL signal amplitude sufficiently to produce an audible response increases interference risks. These experimental findings are consistent with theoretical considerations as well as NTIA's assessments of audible interference effects of actual BPL emissions.

6. CONCLUSION

Because NTIA has been unable to define a suitable means for generation of Access BPL identification codes, NTIA is unable to support a possible requirement for Access BPL transmission of identification codes. NTIA believes that the underlying interference-diagnosis incentive for this potential requirement can be satisfied through various other means for investigating suspected interference.